

Temporal Framework and Sediment Characterization of Long Cores from the New Jersey Shelf in Support of the GEOCLUTTER Initiative

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LONG-TERM GOALS

The long-term goal of this project is to understand the temporal and paleoenvironmental setting for the New Jersey shelf during the latest Quaternary. Precision-sited cores were collected through targets of interest buried beneath the New Jersey shelf in Fall 2002 using the AHC-800 from the RV KNORR. An initial phase of sample analysis, which is funded by this award, is critical for guiding later detailed analysis of the cores collected. As this award is on a March–December cycle, these results represent a mid-year progress report of this year's studies.

OBJECTIVES

The objectives of this work unit are twofold: 1) to determine the temporal framework of major subsurface facies on a broad scale for the New Jersey shelf and 2) to broadly characterize paleoenvironments of the New Jersey shelf during the last sea level cycle.

APPROACH

1) Temporal Framework

The temporal framework will be determined by AMS ^{14}C dating of organic material retrieved from cores collected during the 2002 RV KNORR cruise. Samples were taken where suitable material was visually obvious during core splitting and description at sea. These dates, spanning the range of depositional environments sampled, will provide a means of interpreting the acoustic interfaces observed in high-resolution, Chirp seismic data within a framework relative to Quaternary sea-level cyclicity and timing of channel-forming erosional events.

2) Paleoenvironmental Characterization

The paleoenvironmental characterization is based on identification and analysis of the planktonic and benthic foraminiferal assemblages within the sediments. These organisms provide depositional

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environment and environmental conditions at the time of deposition, both of which are necessary to interpret the stratigraphic setting of buried reflectors. The benthic foraminifera can be used to determine the original environment of deposition because benthic foraminifera have distinct bathymetric preferences. The planktonic foraminiferal faunal population varies with surface water conditions, reflecting glacial-interglacial changes such as temperature, salinity, and upwelling regime. Samples were collected on the cruise from the base of each core tube section to carry out a preliminary examination of foraminiferal assemblages. In addition, grab samples collected by Goff (UTIG) are being examined to provide a broader spatial database of modern foraminiferal assemblage distributions.

WORK COMPLETED

- 1) A total of 19 samples (wood and shell) were collected on shipboard from the cores collected in Fall 2002. These samples were submitted to the AMS facility at the Center for Applied Isotope Studies in Athens, GA and ages were received just prior to submission of this report.
- 2) Most of the core catcher samples and all the grab samples have been washed, picked and analyzed for foraminiferal assemblages. Samples were weighed, washed through a 63 μ m sieve to retain the coarse fraction, and dried in a 60° oven. The coarse fraction was weighed to calculate weight percent sand. The specimens were sorted into species and counted. When all samples are completed, principal component analysis will be performed on the samples with a statistically significant number of specimens. The remainder will be presented as relative abundance data.

RESULTS

- 1) Preliminary, uncalibrated data suggest that all the samples fall within the age range appropriate for ^{14}C analysis (younger than ~47 kyBP). Channel fill sequences are dated at roughly 12-13 kyrs BP, whereas sediments stratigraphically below a regional erosional surface (reflector "R") are dated at 35-45 kyrs BP.
- 2) Core catcher samples were analyzed for foraminiferal content (benthic and planktonic) to determine environment of deposition, and stratigraphic position. Benthic foraminiferal assemblages are generally in agreement with bathymetry and facies. For example, the bioturbated clay present at the deepest water Site 1 (~129 m w.d.) contains a diverse assemblage, including abraded and transported specimens, but also *in situ* components. However, the sediments at Site 2 (~80 m wd) contain a bimodal population: inner – middle neritic sands, as indicated by abundant *Elphidium* spp., and a fluvial-dominated system, as indicated by common pebbles, metamorphic rock fragments, abundant mica, and wood and shell fragments. The grab samples, collected from a variety of environments identified from detailed bathymetric and backscatter analyses, were analyzed for foraminiferal content to assess the environment of deposition and to evaluate reworking. Both the fauna and the mineralogy are varied and reflect the high degree of variability of surface morphology in this region. Generally, the foraminiferal populations are bimodal, with an *in situ* component, and another assemblage of very abraded, reworked foraminifera.

IMPACT/APPLICATIONS

These results are critical to the development of models of acoustic energy-seabed interactions being created by collaborating groups. Age and depositional environments are fundamental parameters for

extending the site-specific modeling concepts more widely using the large dataset of high-resolution geophysics from the New Jersey shelf.

TRANSITIONS

Results are just beginning to be transmitted to collaborating groups and incorporated into acoustic models of the seabed.

RELATED PROJECTS

Austin (UTIG), Goff (UTIG), Fulthorpe (UTIG) and Sommerfield (UDel) and an UTIG PhD student are using the data from this project for a variety of geophysical and geologic interpretations. These include determination of synthetic seismograms for comparison to Chirp data collected on the NJ shelf, water depth and paleoenvironmental interpretations, age of channeling and infill during sealevel cycling and geoacoustic response of seabed sediments.

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PATENTS

none